Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Guidelines for Evaluating the	)	ET Docket No. 93-62
Environmental Effects of	)	
Radiofrequency Radiation	)	

To: The Commission

COMMENTS OF
McCAW CELLULAR COMMUNICATIONS, INC.

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SUMMARY

Adoption of the 1992 ANSI/IEEE Safety Standard. In this proceeding, the Commission solicits comment on adoption of the 1992 ANSI/IEEE safety standard to regulate RF exposure. McCaw fully supports the Commission's protection of the public interest in the safe deployment of wireless services. ANSI/IEEE C95.1-1992 provides the most current and scientifically sound safety guideline for evaluating licensees' obligations under the National Environmental Policy Act. ANSI/IEEE C95.1-1992 represents the consensus of a broad range of the nation's experts in RF radiation and related fields regarding safe levels of exposure for workers and the public.

Categorical Exemptions for Part 21 and Part 22 Base Station Transmitters. As it has in the past, in implementing the refined standard, the Commission should carefully balance the burden of preparing extensive unnecessary compliance showings against the remote possibility that facilities will actually exceed the standard. The record shows that such balancing strongly supports retaining the categorical exclusion for paging and cellular base stations and microwave relay stations. These facilities operate at low power levels and are subject to a number of engineering and practical constraints that severely limit the possibility of exceeding the ANSI/IEEE safety standard. Compliance with the ANSI/IEEE safety standard has been empirically demonstrated by numerous site evaluations and studies concerning the RF environment near these types of transmission facilities. The exposures associated with typical paging, cellular, and microwave transmitters are well below the maximum permitted exposures specified in the ANSI/IEEE, NCRP, and IRPA safety standards and are not significantly different that ambient levels present in every modern community. Based on this data, and the design constraints of these communication facilities,

continuation of the categorical exemption for Part 22 and Part 21 fixed transmitters is warranted.

Cellular Handset Performance. McCaw also briefly discusses data concerning the performance of handheld cellular transmitters relative to the new ANSI/IEEE standard. The results of a recent study by Dr. Om Gandhi, a leading researcher in this field, demonstrate typical cellular handheld phones in use today radiate at levels far below the requirements of the ANSI/IEEE standard. These results should reassure the public and the FCC that cellular handheld phones are safe. They should also provide valuable information for the manufacturing community which should ultimately be charged with the responsibility for showing that its equipment complies with the ANSI/IEEE standard.

Preemption of State and Local RF Exposure Oversight. As a final matter, McCaw requests the Commission to initiate further proceedings in this docket to preempt state and local oversight over RF exposure from cellular facilities. In recent years, opponents of the construction of new cellular facilities have invoked RF exposure concerns in their efforts to persuade state and local governments to withhold permission for new cell sites. As a result, permitting proceedings have bogged down the process of adding new cell sites and modifying existing sites to the point where important federal policies are being adversely affected. Delays and denials of local zoning and building permits based upon irrational fears, unscientific information, or conflicting RF exposure limits are creating a critical problem for carriers and threatening the integrity of a wireless communications network that must continually evolve. Unlike many other classes of radio facilities, cellular systems are always in flux and must rapidly respond to changes in customer demand, alterations in traffic and

usage patterns, construction of new buildings or structures, and even rerouting caused by natural disasters such as the recent Los Angeles earthquake.

Under the circumstances, McCaw believes limited preemption of state and local RF exposure oversight is warranted to assure the public's access to a high quality, low cost, ubiquitous and spectrum efficient cellular telecommunications network. The three federal agencies primarily responsible for RF regulation--the FCC, EPA, and FDA--have proposed substantially similar limits on RF exposure at cellular frequencies. Based on this unanimity, McCaw believes that the FCC should take the added step of stating that compliance with the exposure limits in the 1992 ANSI/IEEE safety standard is sufficient to assure public and occupational safety, and that additional local oversight of RF exposure impinges upon important federal policies by restricting the deployment of communications facilities found to be in the public interest.

In short, McCaw commends the FCC for its efforts to ensure the protection of the public interest by updating its regulations to conform to the ANSI/IEEE C95.1-1992 standard on RF exposure. Likewise, the Commission should protect the deployment of necessary communications services, like cellular,[1] by avoiding the imposition of needless compliance burdens on facilities that are unlikely to exceed the safety standard. In addition, in

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[1] Every day, cellular phones help ordinary people caught in extraordinary circumstances. Examples where McCaw customers have used their cellular phones to summon assistance, for example, include a California fisherman whose boat began to sink, a Washington grandmother who revived her grandson by receiving cardiopulmonary resuscitation instructions over her portable phone, and a Florida father who delivered his daughter while stalled in a traffic jam. The cellular communications network also plays an important, though less obvious, role in the emergency response capabilities of communities, by allowing paramedics in responding ambulances to establish direct contact with callers, allowing police and fire departments to coordinate emergency responses to natural disasters, and allowing motorists to summon aid and to serve as "an extra set of eyes and ears on the road" for police. These examples underscore the numerous positive contributions of cellular technology to the public health and welfare.

recognition of the broad federal consensus in this proceeding, the FCC should consider a limited preemption of state and local RF regulations that unnecessarily hinder the deployment, maintenance, and operation of the nation's cellular communications network.

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McCaw Cellular Communications, Inc. ["McCaw"], by its attorneys, hereby comments on the *Notice of Proposed Rulemaking* in the above-captioned proceeding.[2] McCaw supports the *Notice*'s proposal to rely upon the 1992 American National Standards Institute ["ANSI"] and Institute of Electrical and Electronic Engineers ["IEEE"] radiofrequency ["RF"] safety standard.[3] The 1992 ANSI/IEEE safety standard provides a sound basis for assessing the environmental impact of the Commission's radio licensing actions by setting rational scientifically-based exposure limits.

In implementing the 1992 ANSI/IEEE standard, the Commission should take two actions with respect to cellular and paging carriers. First, because of the minimal potential for cellular, paging, and microwave relay facilities to reach exposure levels exceeding the ANSI/IEEE safety standard, the Commission should retain the existing categorical exemption

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[2] 8 FCC Rcd 2849 (1993) ["*Notice*" or "*NPRM*"]. Pursuant to a series of extension of time orders released on August 4, 1993 (DA 93-864), November 8, 1993 (DA 93-1350), and January 10, 1994 (DA 94-34), comments are due on January 25, 1994, with replies due February 24, 1994.

[3] ANSI/IEEE C95.1-1992, Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz (ANSI/IEEE Apr. 27, 1992) (previously released as IEEE C95.1-1991) ["ANSI/IEEE C95.1-1992"].

from routine environmental processing for these Part 22 base stations and Part 21 microwave relay stations. Second, due to the increasing difficulties with reconciling state and local oversight of RF exposure with the maintenance, expansion, and improvement of the nation's cellular network, the Commission should issue a further notice in this proceeding to preempt non-federal oversight of RF exposure related to cellular facilities.

I. THE COMMISSION SHOULD ADOPT THE 1992 ANSI/IEEE SAFETY STANDARD

The National Environmental Policy Act of 1969[4] requires promulgation of environmental processing rules to ensure that FCC-regulated transmitters and facilities do not adversely affect the environment. This obligation includes implementing rules to assess the safety of RF exposure. Although the Commission has noted that it possesses "neither the expertise nor the jurisdiction to *develop* . . . radiation exposure guidelines," the Commission has also stated that it clearly possesses "the expertise and authority to *recognize* technically sound standards promulgated by reputable and competent organizations such as ANSI."[5] Based upon its evaluation of the ANSI standard as "technically sound" and its observation that the standard was "developed by a panel of experts based on the best scientific information available at the time concerning safe levels of exposure to RF radiation for workers and the general public," the Commission now relies upon the 1982 ANSI safety standards to discharge its NEPA obligations.[6]

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[4] 42 U.S.C. §§ 4321-4370 (1988) ["NEPA"].

[5] *Biological Effects of Radiofrequency Radiation*, 100 F.C.C.2d 543, 551 (1985) ["*Report and Order*"].

[6] 8 FCC Rcd at 2849.

This proceeding has been initiated because ANSI and IEEE have approved refinements to the 1982 RF exposure standard upon which the FCC's current regulations are based.[7] The same factors that the Commission found persuasive in 1985 call for adoption of the 1992 ANSI/IEEE safety standards today:

- ***The ANSI/IEEE process ensured representation from a broad range of scientific disciplines.*** Before being finalized, ANSI/IEEE C95.1-1992 was evaluated by a 125 member subcommittee ranging from molecular biologists to statisticians to electrical engineers. After nine years of consultation and review, the IEEE committee approved the new standard on September 26, 1991, and ANSI independently approved the standard on November 18, 1992. As such, the standard reflects the consensus of a broad range of the country's scientific and technical experts.

- ***The 1992 ANSI/IEEE safety standard incorporates a large database of scientific findings on RF bioeffects.*** Beginning with thousands of papers on RF radiation, the Literature Surveillance Group selected 321 peer-reviewed documents representing the current state of knowledge on potential RF bioeffects. This list was further narrowed by identifying 120 of the papers as meeting pre-defined validation criteria to ensure the findings were based on objective, scientifically rigorous, and statistically reliable studies. This extensive database thus provides a solid, scientific foundation for the 1992 ANSI/IEEE safety standard and includes all relevant, reliable, and scientific findings on RF bioeffects.[8]

- ***The ANSI/IEEE standard addresses all environmentally significant aspects of RF exposure.*** In developing and refining the ANSI/IEEE standard, Subcommittee IV's intent was to protect all individuals from harm by any mechanism.[9] The standard reaffirms the 1982 determination that the threshold for biological effects is 4 W/kg. The refined standard also uses the 1982 ANSI safety factor of 10, yielding a maximum specific absorption rate ["SAR"] of 0.4 W/kg, as the basis for determining

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[7] While the FCC refers to the 1992 standards as "new", "refined" may be a more appropriate term. *See* ANSI/IEEE C95.1-1992 at 22 (noting "Subcommittee IV has met at least once and usually twice annually to review a wide range of proposed refinements of the ANSI 1982 standard").

[8] The Environmental Protection Agency ["EPA"] notes that "[t]here are no substantive differences in the literature base supporting [the ANSI/IEEE and NCRP] standards, except for the literature on RF shocks and burns." Comments of the Environmental Protection Agency at 2, ET Docket 93-62 (filed Nov. 9, 1993) ["*EPA Comments*"].

[9] *See* ANSI/IEEE C95.1-1992 at 23 (stating "the responsibility of the . . . Subcommittee IV is adherence to the scientific base of data in the determination of exposure levels that will be safe not only for personnel in the working environment, but also for the public at large").

maximum permissible exposure ["MPE"] in so-called "controlled" environments where the only individuals present are aware of biological effects of RF radiation.[10] In other "uncontrolled" environments, the refined standard implements a safety factor of 50, yielding a maximum SAR of 0.08 W/kg.[11]

- ***ANSI/IEEE C95.1-1992 incorporates substantial safety factors.*** ANSI/IEEE C95.1-1992 incorporates numerous "conservative assumptions" that implicitly contribute to safety. In particular, the standard: (1) does not consider whether biological effects are temporary or reversible, classifying any observable biological effect as a hazard; (2) does not recognize any difference between the arguably better ability of humans to cope with internal temperature changes than test animals used in the studies; (3) uses "worst case," E-polarized RF fields as the reference condition; and, (4) employs only one contour of resonant frequencies for all humans, regardless of size, and does not consider the decrease in SAR for non-resonant frequencies for different sized individuals.[12] These factors "provide a degree of safety or freedom from hazard for a given human over time and space much greater than is implied by the explicit safety factor" in the standard.[13]

- ***The ANSI/IEEE findings are consistent with other standard-setting efforts.*** ANSI has provided the basis for almost all national and industrial RF exposure standards for the last twenty-five years[14] and its findings are consistent with the findings of other standards groups, such as the National Council on Radiation Protection and Measurements ["NCRP"] and the International Radiation Protection Association ["IRPA"].[15] Specifically, the 1986 NCRP exposure guideline, like the 1992

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[10] *See* ANSI/IEEE C95.1-1992 at 23 (noting "[a] majority of the Risk Assessment Working Group agreed that the literature is still supportive of the 4 W/kg criterion" and "[n]o verified reports exist of injury to human beings or of adverse effects on the health of human beings who have been exposed to electromagnetic fields within the limits of frequency and SAR specified by . . . ANSI C95.1-1982").

[11] The additional 5 fold safety factor for uncontrolled environments above and beyond the safety factor of 10 for controlled environments thus is not the result of ANSI/IEEE having defined a lower threshold for adverse biological effects, but rather implementation of a two-tier standard prompted by member input.

[12] ANSI/IEEE C95.1-1992 at 28-29.

[13] *Id.* at 29.

[14] *See* ANSI C95.1-1982 at 11.

[15] Although EPA favors adoption of the NCRP standard, the ANSI/IEEE and NCRP standards are substantially similar at cellular frequencies. In fact, EPA's enumerated criticisms are generally irrelevant for cellular services since: (1) neither ANSI/IEEE nor EPA deem it necessary at this time to specifically address alternative standards for non-thermal effects; (2) both standards relate the maximum field strength to frequency using a formula of (f/1500 Hz) that applies well beyond cellular frequencies; (3) EPA agrees that the FCC's proposed implementation of the controlled/uncontrolled dichotomy is similar to the two-tier occupational/general

ANSI/IEEE standard, recommends limiting average exposure for cellular frequencies for the general population to approximately 0.6 mW/cm^2 and IRPA sets a comparable limit of approximately 0.4 mW/cm^2. The close correlation between these independent standards provides additional assurances regarding the objectivity of ANSI/IEEE's results.

In short, the 1992 ANSI/IEEE standard appears to be the most comprehensive and scientific consensus standard available. It is consistent with the findings of other independent standards groups and incorporates both explicit and implicit safety factors to define MPEs far below any recognized threshold for biological effects. Accordingly, for the same reasons that the FCC adopted the 1982 ANSI standard as a basis for its RF exposure assessments, it should now rely on the 1992 ANSI/IEEE standard.

II. THE COMMISSION SHOULD RETAIN THE CATEGORICAL EXCLUSION FOR PART 21 AND PART 22 BASE STATION TRANSMITTERS

The evidence shows that typical radio transmitters for Part 22 cellular and paging and Part 21 microwave point-to-point operations do not exceed the relevant MPEs specified in ANSI/IEEE C95.1-1992. As discussed below, the practical realities of base station deployment and advances in technology create minimal potential for cellular, paging, or point-to-point microwave base stations to radiate at levels approaching the ANSI/IEEE, NCRP, or IRPA standards. This conclusion is supported by field test data and studies characterizing the typical RF environment around these transmitters. Due to the extremely limited potential for these facilities to pose any environmental concern and the burden of

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population standard used in the NCRP standard; and (4) RF shock and induced currents are not a concern at cellular frequencies in any event. *See EPA Comments* at 1-3 & Attachment at 1-8; *see also* Comments of the Center for Devices and Radiological Health, Food and Drug Administration, Department of Health and Human Services at 2, ET Docket No. 93-62 (filed Nov. 9, 1993) ["*FDA Comments*"].

requiring extensive compliance certification, McCaw believes that continuation of the existing categorical exemption for these facilities is warranted.

McCaw's experience and data also show that typical handheld cellular telephones do not pose any exposure concerns. In a study commissioned by McCaw, Dr. Om Gandhi tested a number of cellular handsets and determined that all of the telephones met the ANSI/IEEE SAR limits by a wide margin. Dr. Gandhi's study should reassure the public and the Commission that cellular phones are safe. It should also provide valuable information for cellular equipment manufacturers who are better situated than a facilities-based provider, such as McCaw, to comment on what procedures should be utilized to ensure that all cellular handsets meet the relevant exposure criteria.

A. Part 21 and Part 22 Base Station Transmitter Facilities Should Continue To Be Categorically Excluded From Routine Environmental Processing

Cellular, paging, and fixed microwave transmitters should be categorically excluded from environmental processing because such facilities are "highly unlikely"[16] to exceed exposure criteria established under the 1992 ANSI/IEEE safety standards for either controlled or uncontrolled environments. Indeed, as discussed below, given the inherent cellular design, engineering, and site selection practices minimizing exposure, these facilities have

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[16] The concept of a "categorical exclusion" was adopted in 1987 to exempt carriers from routinely submitting environmental analyses of potential RF radiation hazards in cases where transmitters were highly unlikely to exceed the 1982 ANSI protection guidelines. *See Biological Effects of Radiofrequency Radiation*, 2 FCC Rcd 2064-2065 (stating "[w]ith regard to land-mobile base stations and other fixed facilities, we do not believe that environmentally significant exposure is possible due to the relative inaccessibility of such antennas and their relatively low operating power levels" and that a basis for an exclusion existed where "the likelihood of the protection guides actually being exceeded is slight" and noting that an exclusion is justified even in a case where "hypothetically, RF radiation limits could be exceeded in a few instances, such situations apparently seldom occur in actual operation") ["*Second Report and Order*"]; *erratum* 2 FCC Rcd 2526 (1987).

minimal potential to create environmentally significant exposure. Under the circumstances, the burden of requiring extensive compliance exhibits for new facilities--much less retroactive compliance showings--is unjustified.

1. Cellular and paging base stations are highly unlikely to exceed relevant safety standards

As the Commission recognized in 1985, potential exposure from cellular and paging base stations is limited by a number of engineering factors.[17] The following characteristics of Part 22 operation contribute to assuring the safety of the environment around such base stations:

- ***The low power of Part 22 base stations limits potential exposure.*** As the FCC has previously recognized, cellular and paging base stations use low power transmitters that are unlikely to expose humans to fields in excess of the safety standards.[18] For example, the majority of cell sites in urban and suburban areas operate at ERPs of 100 watts or less per channel, and in large cities, the ERPs are generally 10 watts or less per channel.[19]

- ***Cellular and paging antenna design minimizes potential exposure.*** As IEEE's Committee on Man and Radiation ["COMAR"] explains in a position statement on cellular base stations, the antennas used to provide service minimize the potential exposure under most circumstances. The paper explains that "the energy from a cell-site antenna is directed toward the horizon in a relatively narrow beam in the vertical plane . . . [so] [a]s one moves away from the antenna, the power density decreases as the inverse square of the distance, and consequently, the exposure at ground-level in

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[17] *Id.*, 2 FCC Rcd at 2066 (stating "[w]ith regard to land-mobile base stations and other fixed facilities, we do not believe that environmentally significant exposure is possible due to the relative inaccessibility of such antennas and their relatively low operating power levels").

[18] *Id.*

[19] *See* Human Exposure to RF Emissions from Cellular Radio Base Station Antennas at 2, *Entity Position Statement* (IEEE COMAR May 1992) (stating "[t]he [cellular] system is self-limiting in the sense that as the system expands and cells are subdivided, the transmitter power is reduced to prevent interference with remote cells.") (attached as Exhibit A) ["*COMAR May 1992 Statement*"].

the vicinity of an antenna tower is relatively low compared with the exposure very close to the antenna itself."[20]

- ***The inaccessibility of Part 22 transmitters reduces potential exposure.*** Cellular and paging base station transmitters are typically installed in locations that are not accessible to the general public. In the cellular service, tower-based transmitters are generally 30 to 75 meters in height above average terrain and in restricted areas.[21] Transmitters in the paging service are generally even higher, since most paging is conducted on a wide-area basis. Furthermore, for security and other reasons, rooftop-based cellular transmitters are typically in areas inaccessible to the general public. Indeed, site security is one of the criteria used by McCaw field personnel--and presumably other cellular carriers[22]--to select appropriate sites.

- ***Building attenuation limits potential exposure.*** Construction materials such as wood or cement block severely attenuate signals, and power densities are generally lower by a factor of ten behind or underneath walls.[23] In addition, most side-mounted antennas are directional with significant rear null areas, and consequently the power density levels behind the sector are hundreds to thousands of times lower than in front: "[L]evels are negligible in rooms directly behind walls where sector antennas are mounted on the sides of buildings."[24]

- ***Intermittent operation reduces potential exposure.*** The FCC has recognized that the intermittent operation of Part 22 base stations minimizes time-averaged exposure.[25] For example, while a cellular site may operate a number of discrete channels, not all of the transmitters are ordinarily activated at once. Because prudent cellular system design provides excess channel capacity at each site to accommodate peak calling periods, many individual transmitters are often idle at any given time. The implementation of digital will further reduce the number of active channels since each channel will serve up to three users simultaneously.

These characteristics make it extremely unlikely that cellular and paging base stations would exceed the limits prescribed by the 1992 ANSI/IEEE safety standards.

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[20] *See COMAR May 1992 Statement* at 2.

[21] *Id.*

[22] *See* 47 C.F.R. § 22.908 (1992) (requiring carriers to limit access to transmitting equipment).

[23] *COMAR May 1992 Statement* at 3.

[24] *Id.*

[25] *Second Report and Order*, 2 FCC Rcd at 2064.

2. Field test data confirm that cellular base stations comply with all exposure limits and safety standards

Industry field studies and empirical measurements of cell sites have verified the low probability of cellular base facilities exceeding the recommended limits for RF radiation. For example, in 1993, Bell Laboratories released a study that was undertaken by R.C. Petersen and P.A. Testagrossa to characterize the RF environment associated with typical cellular base station transmitter sites.[26] In this study, Peterson and Testagrossa found minimal environmental impact from cellular facilities:

- ***Tower mounted transmitters.*** The study measured four different tower-based cellular transmitters using 100 Watt ERP transmitters, and found per-channel maximal power densities generally not to exceed 0.00001 mW/cm^2--readings thousands of times lower than the 0.59 mW/cm^2 MPE specified in ANSI/IEEE C95.1-1992 for uncontrolled environments.[27]

- ***Rooftop mounted transmitters.*** In a separate test using sixteen 100 Watt ERP transmitters mounted 4.4 meters above the roof, Petersen and Testagrossa measured near field (*i.e.*, distances less than 15 meters) maximal power densities at head height below 0.1 mW/cm^2, approximately 1/6th of the MPE for uncontrolled environments and approximately 1/30th of the MPE for controlled environments. In the far field, the power density at head height was less than 0.02 mW/cm^2 at distances up to 20 meters and less than 0.002 mW/cm^2 beyond that distance.[28] The measurements are approximately 1/30th and 1/300th, respectively, of the MPE for uncontrolled environments.

Petersen and Testagrossa concluded that "[t]he measured and corresponding analytical values were found to be well below accepted exposure limits even when extrapolated to

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[26] R.C. Petersen & P.A. Testagrossa, "Radio-Frequency Electromagnetic Fields Associated With Cellular-Radio Cell-Site Antennas," *Bioelectromagnetics*, vol. 13 at 527-542 (1993) (attached as Exhibit C).

[27] *Id.* at 529-533.

[28] *Id.* at 536-541.

simultaneous and continuous operation of the maximal number of transmitters that would be expected to be installed at a cell-site."[29]

Petersen and Testagrossa's results are also similar to the findings of the IEEE's Committee on Man and Radiation. In a 1992 Entity Position Statement, the IEEE Committee on Man and Radiation reported on data that showed "a maximum measured ground-level power density at the base of a 45 meter tower to be of the order of 0.00002 mW/cm^2 per radio channel, corresponding to 0.002 mW/cm^2 for a 96 channel, 100 watts ERP per channel, fully implemented system . . . [with] omni-directional colinear array[] [antennas]."[30] Thus, like Petersen and Testagrossa, the IEEE COMAR found levels of power density for a cell-site with the maximum number of antennas to be 300 times less than the limits specified in the ANSI/IEEE C95.1-1992 standard for uncontrolled environments. The IEEE COMAR concluded that "[m]easurements near typical cellular base stations have shown that exposure levels normally encountered by the public are well below limits recommended by all national and international safety standards" and that "RF radiation from nearby cellular base stations does not significantly increase the reported 'RF background' levels in urban areas."[31]

McCaw's own experience similarly demonstrates that cellular base station facilities operate well within all exposure standards. In order to ensure compliance with applicable exposure standards and for state and local RF exposure regulations, McCaw has undertaken

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[29] *Id.* at 527.

[30] *COMAR May 1992 Statement* at 3.

[31] *COMAR May 1992 Statement* at 1, 3 (citing R.A. Tell & E.D. Mantiply, "Population Exposure to VHF and UHF Broadcast Radiation in the United States" at 6-12, *Proceedings of the IEEE*, vol. 68, no. 1 (1980)).

numerous detailed field studies of its own cellular transmission facilities operating under a variety of conditions with various antenna configurations. These studies were summarized by Dr. Arthur W. Guy[32] and Dr. Jerrold T. Bushberg[33] in the following statements submitted to the California Public Utilities Commission:

- Generalizing from his numerous field studies for McCaw and others, Dr. Bushberg testified that, "[w]hile cellular facilities may differ in their configuration and equipment installations," the "typical electromagnetic environment near the facility is on an order of [0.001 to 0.003 mW/cm^2]."[34] Dr. Bushberg also observed that "[t]he power densities are significantly lower as one moves away from the transmission source, consistent with the inverse square law of radiation physics, which predicts a geometrical diminution in intensity inversely related to the square of the radial distance from the source."[35] He concluded by stating "it is possible for me to say without hesitation that the contribution to public or occupational exposure to electromagnetic energy from cellular transmission facilities would be unlikely to exceed the maximum levels measured and reported in this declaration and the appendices."[36]

- Dr. Guy, for his part, compared the typical calculated power densities of pole mounted and building mounted cellular facilities with the NCRP standard, and concluded "*the calculated levels of radiation from the cellular telephone facilities are two to three hundred times less than [the NCRP] permissible safety level.*"[37]

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[32] Dr. Arthur W. Guy is currently a Professor *emeritus* and Director of the Bioelectromagnetics Research Laboratory, Center for Bioengineering, at the University of Washington in Seattle, and was Chairman from 1971 to 1982 of the ANSI C95 Subcommittee IV on "Safety Levels and/or Tolerances with Respect to Personnel."

[33] Dr. Bushberg is a Clinical Associate Professor, Technical Director of Nuclear Medicine and Radiation Safety Officer at the University of California School of Medicine, Department of Radiology.

[34] Declaration of Dr. Jerrold T. Bushberg, April 4, 1991, at 3 (attached to the Comments of the Cellular Carriers Association of California and the Cellular Telecommunications Industry Association, Cal. Pub. Util. Comm'n Docket No. OII.91-01-012 (filed Apr. 8, 1993)).

[35] *Id.*

[36] *Id.* at 4-5 (the referenced appendices have been attached as Exhibit E).

[37] Declaration of Dr. Arthur W. Guy at 33 (emphasis in original) (attached to the Comments of the Cellular Carriers Association of California and the Cellular Telecommunications Industry Association, Cal. Pub. Util. Comm'n Docket No. OII.91-01-012 (filed Apr. 8, 1993)).

Based upon this data, typical cellular facilities are highly unlikely to exceed the limits specified in the ANSI/IEEE, NCRP, or IRPA standards.

3. Microwave point-to-point transmitters are highly unlikely to exceed the limitations specified in the 1992 ANSI/IEEE protection criteria

Despite the number of microwave relay stations in operation, exposure of the public and workers to any RF radiation from these sources is "practically negligible" for a number of reasons.[38] First, microwave relay transmitters operate at very low power levels. Even when a number of transmitters are coupled to a single antenna, the total radiated power is well below 100 watts and, in many cases, less than 1 watt.[39] Second, energy is propagated from relay antennas in a very narrow, focused beam--similar to that of a spotlight. Third, in order for the system to function properly, a clear, unobstructed line-of-sight path must exist between the transmitting antenna located at one station and the receiving antenna at another and "buildings, and homes, and hence, people, cannot be located in the path of the beam near the transmitting antenna."[40]

These observations are confirmed by field studies on RF radiation from operating microwave relay facilities. In a Bell Laboratories study, R.C. Petersen found that:

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[38] *See* R.C. Petersen, "Microwave Fact Sheet" (citing R.C. Petersen, "Levels of Electromagnetic Energy in the Vicinity of Representative Microwave Relay Towers," *Proceedings of the International Conference on Communications-Boston*, MA, June 10-14, 1979 (IEEE N.Y. 1979); R.C. Petersen, "Electromagnetic Radiation from Selected Telecommunications Systems," *Proceedings of the IEEE*, vol. 68, no. 1 (IEEE 1980)) (attached as Exhibit D).

[39] *Id.*

[40] *Id.*

> [M]easurements made in the vicinity of a large number of "microwave towers" and on rooftops of buildings near microwave antennas indicated that with few exceptions . . ., the levels of electromagnetic energy to which the public is exposed are not distinguishable from the reported ambient background of approximately [0.000005 mW/cm^2].[41]

Even in unlikely exposure conditions, such as directly under the beam path near the base of a microwave tower or directly below a roof-mounted antenna, the measured power densities were thousands of times below ANSI/IEEE, NCRP and IRPA limits.[42] Accordingly, as discussed below, the Commission should retain its policy of excluding Part 21 microwave point-to-point facilities from routine environmental processing.

4. Due to the very limited potential for Part 21 and Part 22 base station transmitters to exceed the 1992 ANSI/IEEE safety standards, application of any new compliance rules should be prospective only

As discussed above, Part 21 and Part 22 base stations should continue to be categorically excluded from routine environmental processing. The evidence shows that typical cellular base stations and microwave relay facilities will not exceed ANSI/IEEE C95.1-1992 safety criteria. The Commission has nonetheless requested comment on "how affected facilities and operations could demonstrate compliance with the new guidelines" in the event existing categorical exclusions are not retained.[43] The Commission has also requested information on "how best to treat . . . facilities that are in use but do not comply

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[41] *Id.*

[42] *Id.*

[43] *Notice*, 8 FCC Rcd at 2852.

with the new guidelines."[44] As discussed below, extensive compliance recertification for Part 21 and Part 22 facilities is unnecessary to protect the public interest.

First, the benefits of requiring recertification of existing Part 21 and Part 22 facilities are minimal at best. Most importantly, there is strong evidence showing insignificant potential for these facilities to exceed ANSI/IEEE, NCRP, or IRPA MPE limits. Moreover, ANSI/IEEE have explicitly reaffirmed the safety of facilities conforming to prior ANSI standards.[45]

Second, any recertification process would be extraordinarily burdensome. McCaw has over 1500 cell sites, not including microwave facilities, and in the New York MSA alone, McCaw has over 260 cell sites under a single license. McCaw's experience in performing cell site RF assessments indicates that each site requires approximately 1/3 of a day in field time alone, not including time needed to prepare a report. McCaw estimates that it would require over two years of field time to conduct cell site measurements for all of McCaw's cellular base stations, and double that if microwave facilities were included. Under the circumstances, retroactive compliance certification would be tremendously burdensome and any certification procedures for non-categorically exempt facilities under the new compliance rules should be prospective only.

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[44] *Id.* at 2853.

[45] *See* ANSI/IEEE C95.1-1992 at 23 (stating "[n]o verified reports exist of injury to human beings or of adverse effects on the health of human beings who have been exposed to electromagnetic fields within the limits of frequency and SAR specified by . . . ANSI C95.1-1982").

B. The Evidence Shows That Cellular Portables Are Unlikely To Exceed the 1992 ANSI/IEEE Safety Standards

The evidence on RF exposure demonstrates that the "press scares and media hype"[46] surrounding the use of cellular portables are unfounded.[47] Indeed, the FCC categorically exempted all cellular transmitters--including mobiles and portables--from environmental processing in 1987 based, in part, on the "relatively low operating power[]" and the "intermittent use (low duty factor[])" of cellular mobile transmitters.[48] Studies conducted by the FCC and the FDA also support the safety of low power handheld phones,[49] and the Committee on Man and Radiation of the IEEE has stated "based on present knowledge, the exposures from low-power transceivers and cellular telephones are considered to be without risk for the users and for the public."[50]

Nonetheless, in response to questions raised about the safety of cellular portables, McCaw recently requested Dr. Om P. Gandhi, Chairman of the Electrical Engineering Department at the University of Utah and co-chairman of the committee that established the 1992 ANSI/IEEE safety standards for RF exposure, to test the emissions from portable

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[46] *See Notice*, 8 FCC Rcd at 2862 (Separate Statement of Commissioner Ervin S. Duggan).

[47] Portable cellular telephones are the popular, lightweight pocket phones that incorporate an antenna into the body of the telephone. Other types of cellular phones, such as car phones or transportable "bag" phones, do not incorporate the antenna into the handset so RF exposure from the handset is negligible.

[48] *Second Report and Order*, 2 FCC Rcd at 2064

[49] R.F. Cleveland, Jr. & T.W. Athey, "Specific Absorption Rate (SAR) in Models of the Human Head Exposed to Hand-Held UHF Portable Radios," *Bioelectromagnetics*, vol. 10 at 173-186 (1989).

[50] Human Exposure to Radiofrequency Fields from Portable and Mobile Telephones and Other Communication Devices at 1, *Entity Position Statement* (IEEE COMAR Dec. 1992) (attached as Exhibit B).

cellular handsets. Under a grant from the National Institute of Health,[51] Dr. Gandhi had developed a sophisticated computer-based model to assess the distribution and absorption of electromagnetic energy for complex exposure situations. With additional funding from McCaw, Dr. Gandhi applied this model to 10 cellular handsets from four different manufacturers. Using very conservative assumptions,[52] Dr. Gandhi found that the peak SAR averaged over one gram ranged from 0.09 to 0.29 W/kg, less than one-fifth of the specification in the 1992 ANSI/IEEE safety standards. Moreover, for the whole body average SAR, depending upon the phone and antenna, Dr. Gandhi found readings ranging between 0.5 to 1.1 mW/kg, a full 70 to 160 times *smaller* than the 80 mW/kg whole body average SAR considered safe under the 1992 ANSI/IEEE safety standards. The summary from Dr. Gandhi's work has been attached hereto as Exhibit F.

While McCaw believes Dr. Gandhi's research is an important indicator of the safety of typical cellular phones, McCaw does not possess the design and fabrication expertise to warrant extrapolating Dr. Gandhi's results to all cellular phones. Rather, McCaw believes

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[51] "Electromagnetic Energy Absorption and Its Distribution In Humans for Complex Exposure Profiles," National Institute of Environmental Health Sciences Grant 5 ROIES 03329-09.

[52] Dr. Gandhi assumed an exposure time of thirty minutes and full power (600 mW) output from the portables. In contrast, the 1992 ANSI/IEEE safety standards specify exposures *averaged* over 6 or 30 minutes. Considering that the large majority of cellular calls last less than three minutes, the time-averaged values of the whole body average and spatial peak SARs will usually be smaller than the values reported in Dr. Gandhi's results. In addition, a maximum transmit power of 600 mW allows reliable communication with a base station 2 miles away. However, all cellular telephones use "adaptive power control" that adjusts the power down in steps--from 600 mW to 250 mW to 100 mW to 40 mW to 15 mW to 6 mW--so that the portable operates at the minimum power necessary to provide a clear signal and minimize interference. Because a portable functioning at 6 mW will allow communication with a base station up to 1/2 miles away, cellular portables are estimated to operate at 250 mW or less 95 percent of the time in an urban environment. *See* Statement by Thomas E. Wheeler, President, Cellular Telecommunications Industry Association (rel. Mar. 11, 1993).

that cellular equipment manufacturers are better situated to comment on what procedures should be utilized to ensure that all cellular handsets meet the relevant exposure criteria.

III. THE FCC SHOULD CONSIDER PREEMPTING INCONSISTENT STATE AND LOCAL OVERSIGHT OF RF EXPOSURE FROM CELLULAR BASE STATIONS

In recent years, local governments have resorted frequently to raising RF exposure concerns as a basis for denying or delaying cellular system construction. While McCaw does not dispute the essential role that local governments play in resolving concerns associated with the aesthetics of cell site construction and with the structural safety of cellular towers, McCaw does question the appropriateness of local oversight of RF exposure standards, particularly when the RF exposure issue is often merely the stalking horse of other community concerns and when the FCC is equipped to establish a uniform, national standard for exposure limits. In this proceeding, the FCC--with the input of the FDA and the EPA--is in the process of implementing a federal standard for radio emissions that embodies an expert determination based on scientific evidence of safety concerns arising from the use of radio systems. Once an appropriate scientific safety standard is in place, the FCC should determine that continued state and local oversight of RF exposure is unnecessary, threatens the ability of the nation's cellular network to develop and expand consistent with stated federal goals, and should be preempted. Appropriate federal guidelines are necessary to ensure that recent actions by state and local governments that deny the public the benefits of cellular service are avoided in the future.

A. The Public Interest Supports Federal Preemption of Inconsistent State and Local Oversight of RF Exposure From Cellular Facilities

The recent sensationalist media coverage of cellular handset safety has encouraged those who oppose cellular system construction to invoke RF exposure concerns as a further tactic to thwart the installation of new cell sites or even the modification of existing ones. In response, state legislatures, county boards, and even cities have cited RF exposure fears as the basis for permit denials (often as a smokescreen to camouflage aesthetics concerns);[53] in some cases, they have also adopted RF exposure rules that are inconsistent with scientific evidence[54] and current federal standards or, for that matter, any standards that are likely to be adopted in this proceeding.[55] Other states are, or are in the process of, levying fees against radio owners to fund further RF exposure regulation or have enacted complex and burdensome RF compliance procedures.[56] Legal actions by neighborhood groups are

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[53] While McCaw understands the traditional reservation of authority to the states to regulate land use and aesthetics, the use of RF exposure issues to mask inappropriate, discriminatory, or otherwise unjustifiably restrictive decisions must not be tolerated.

[54] The town of Los Gatos, for example, ignored scientific testimony that a proposed GTE Mobilnet site would produce only about 0.003 mW/cm^2 in denying the company a permit. *GTE Mobilnet of California v. Town of Los Gatos*, CV 736785 (Santa Clara Cty Sup. Ct.).

[55] *See, e.g.*, Comments of Sheldon L. Epstein at 3, ET Docket 93-62 (filed Nov. 4, 1993) (describing the City of Willamette's ordinance requiring ground level RF emissions to be below 0.00025 mW/cm^2--over *two thousand times* smaller than the ANSI/IEEE C95.1-1992 limits at cellular frequencies).

[56] *See, e.g., Fees for the Registration of Nonionizing Radiation Producing Sources*, 25 N.J. Reg. 5422 (Dec. 6, 1993); Reply Comments of Celpage, Inc. at 5-6, ET Docket No. 93-62 (filed Dec. 9, 1993) (discussing Puerto Rican RF exposure regulation).